of Plymouth," is valuable and readable, containing the results of careful observation. "A Catalogue of the Geometrina of Plymouth and its Vicinity," by Mr. G. C. Bignell, will interest entomologists. "Our Obligation to Greek Thought," by Prof. Chapman, is a thoughtful paper, and there are several other excellent papers of historical and antiquarian interest.

Vulcanologische Studien. Von Dr. Eduard Reyer. (Wien: 1878.)

WE have already had occasion to direct attention to the valuable contributions to the theory of volcanoes which have recently been published by Dr. Reyer, of Vienna. The memoir before us fully maintains the reputation of its author as an able investigator and original thinker. In it he discusses the nature of the materials which remain in the throat and deeper portions of a volcanic vent, after the eruptive action has ceased, and the features presented by those volcanic cones which are formed not by violent explosive action but by the quiet outwelling of liquid lava. Dr. Reyer's remarks on both these questions will be found to be eminently valuable and suggestive. J. W. J.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*

[*The Editor urgently requests correspondents to keep their letters as short as possible. The pressure on his space is so great that it is impossible otherwise to ensure the appearance even of communications containing interesting and novel facts.*]

Is the Sun One-sided?

WHEN Broun and Hornstein detected the existence of a terrestrial magnetic inequality, of which the period is nearly that of the sun's rotation, it was natural to regard this inequality as a direct result of the rotation of our luminary. Nevertheless, there are grave reasons against this hypothesis. In the first place, it is extremely difficult to imagine the sun to be one-sided in its magnetic influence. From what we know of our luminary, it must in a great measure be composed of gaseous matter, of which the outer layers are in violent motion, so that we can hardly imagine one meridian to be permanently different from another.

Another objection is derived from the fact that the period of this peculiar magnetic inequality (of whose existence there can be no doubt) is very nearly that of the sun's rotation in space, and decidedly less than that of its synodic rotation. Now, if we can imagine the sun to affect the earth in this peculiar manner, we should be inclined to suppose that the period of such influence would be that of its synodic rotation, that is to say, of its rotation with regard to the earth.

But if this inequality be not due to the sun's rotation, how (it may be asked) is it possible to account for it?

In the first place there is accumulating evidence of the existence of an intra-mercurial planet with a time of revolution, not differing greatly from that of the sun's rotation. Again, there can be little doubt that we have various magnetic inequalities, of which the periods are the same as those of the most prominent planetary configurations. May not, therefore, this magnetic inequality be connected with the intra-mercurial planet of the existence of which we are becoming sure, and is it not possible that a discussion of magnetic changes may aid us in settling this very interesting and important question?

St. Andrews, August 26 BALFOUR STEWART

Von Cotta's "Geologie der Gegenwart"

YOUR journal contains, in the number for August 8, a short notice of my newly-published "Geologie der Gegenwart," with a signal misrepresentation of the coloured frontispiece, beginning with the lines, "We can scarcely regard," to the end of the paragraph.

The illustration in question really is a representation of the fact that igneous rocks—both volcanic and plutonic—being originally products of the central parts of earth, form different species, according to their being rich in silica (acidic rocks) or poor in silica (basic rocks), and according to their consolidation at a considerable depth as *plutonic*, or nearer the surface as *volcanic* rocks. Becoming solid at a great depth, the *acidic* fluids have formed granites or porphyrites; nearer the surface, trachytes or trachytic lavas. The *basic* fluids, on the other hand, became syenites or greenstones at a great depth, and basalts or basaltic lavas nearer the surface.

All these various rocks by no means belong to particular geological periods, but *at all times* have either overflowed or penetrated other formations, and been accompanied by tuff formations.

The misapprehension contained in your notice is doubly painful to me, because I think I have been the first German geologist who decidedly adopted Lyell's view with regard to the utter independence of the nature of rocks from their geologic age: witness the first edition of my "Geologie der Gegenwart," published in 1866. BERNHARD V. COTTA

Freiberg

On the Wax of Pœciloptera

A SPECIES of Pœciloptera was this year rather common in the neighbourhood of this city, covering thickly the branches of *Cassia obtusifolia*, L., and more sparingly of *Cassia spectabilis*, D.C. I have not the means of identifying the species; I inclose, therefore, the wings of a specimen, so that some entomologist may give you the right name.[1] The females of Pœciloptera, as indeed of many other Fulgoridæ, are known to have the property of secreting a wax-like substance from between their abdominal rings, and especially from peculiar appendages of the last ring. This substance is, in the present species, of a beautiful white colour, glossy like silk, and formed of exceedingly thin threads, 1-500 to 1-700 of a millimetre thick, and generally less than a centimetre long. When taken off the living insect, the latter will be found to produce new threads in somewhat less than twenty-four hours. The threads are pure wax, lighter than water, insoluble in cold alcohol and ether, but dissolving a little in hot alcohol, and very easily in hot benzol. The fusing-point I found by repeated experiments to be *a little higher* than that of boiling water, though I could not determine it exactly, owing to the small quantity of wax I had collected (from 150 insects I obtained but six centigrammes of wax). In a heated silver spoon, or on platin-foil, the wax melted very easily, leaving no residue whatever. The molten wax was at first of a light yellow colour, which disappeared again after its getting cold.

The late Mr. D. Hanbury, in a paper on the insect-white-wax of China ("Science Papers," 62), quotes the statement of Capt. Hutton as to the properties of the wax of *Flata limbata*, an insect closely related to the Pœciloptera. It is said to "dissolve readily in water, while the attempt to melt it on the fire without water or oil proved altogether abortive, the wax merely burning and consuming away till it became converted into a hard and baked substance." This is certainly very singular, and it appears to me highly questionable whether Capt. Hutton's so-called *wax* was any wax at all.

I have not been able to find out what can be the benefit the insects derive from these copious secretions; but as they occur only in the females, there will probably be some connection with the egg-laying or hatching process. I observed no males, and could discover no eggs even in places where the females were thickly crowded on the branches. I should add that the insect is generally rather uncommon in our local fauna.

Carácas, July 15 A. ERNST

Spontaneous Combustion of Wasps' Nests

SOME time ago the house of General P. M. Arismendi (now Consul of Venezuela, in Port-of-Spain, Trinidad) in this city, had a rather narrow escape from being set on fire by the spontaneous combustion of a large wasps' nest (a species of *Polistes*) in a closet under a roof. The day was exceedingly hot; but this circumstance, I think, has a very slight connection (if any at all) with the outbreak of smoke from the nest. Roofs in this country are constructed of tiles supported by a thick layer of compact earth, which rests on the usual lath-work of dry canes (the stems of *Gynerium saccharoides*, or arborescent grass), both being substances that conduct heat very badly.

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[1] An entomological correspondent informs us that the wing is that of *Pœciloptera phalænoides*, Linn., and agrees with Stoll's figure of the insect from Surinam.—ED.

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The source of heat must therefore have been in the nest itself. In bees-hives the temperature rises sometimes as high as 38° C. (*teste* Newport, as cited in Girdwoyn, "Anat. et Physiol. de l'Abeille," p. 23). We may be allowed to suppose that something similar happens occasionally also in wasps' nests. Such a heat might be caused by an alteration beginning in the wax, hydrocarbons being formed, which, on being absorbed by the paper-like, porous substance of the cell-walls, must get still more heated, so that a comparatively small access of oxygen would be sufficient to set the whole nest on fire.

I have been assured that the spontaneous combustion of wasps' nests is a well-known fact in the interior of Venezuela, and as I do not recollect having found it mentioned in books, it appeared to me worth while to inquire whether something similar has been observed in other parts of the world, and if so, whether my explanation will hold good in all cases.

Carácas, July 15 A. ERNST

Observations on a "Dust-Whirl"

WHILE making magnetic determinations at Kirksville, Mo., several "dust-whirls," or small whirlwinds, were observed, which, although not destructive in their effects, were unusually violent. The dust was carried by strong surface-winds, which rushed inward to the centre of the whirl, rising in a vast column 200 feet high.

One of these whirls crossed a pond of water, moving very slowly, and in a zigzag path. The water immediately became agitated, a *depression* was formed, which extended to the bottom of the pond (which was about five feet in depth). The top of the cup-shaped depression was about six feet in diameter, the bottom about four or five feet. There was no water drawn up from the pond, so far as could be observed, although a little of the rapidly whirling water at the edge of the depression was thrown outwards upon the surface of the pond.

Kirksville is situated in the northern part of the State of Missouri, and on the summit of the divide between the Mississippi and Missouri Rivers. During the present summer it has had the least rain in the State, and is yet parched by excessive drought. FRANCIS E. NIPHER

August 5

The Telephone

ON to the centre of a telephone vibrating disc, and perpendicular to its plane, a light needle ½ inch long was soldered, the disc held in a holder, mouth-piece, &c., the same as a telephone, and so arranged that the needle would vibrate in a small cylindrical ebonite cup, ¼ inch in diameter and ¾ inch long, the top of the ebonite cup just free from touching the vibrating disc; a copper wire was let into the centre of the bottom of the cylinder, flush with the bottom; the cylinder was filled full with the finest dust of iron filings well shaken down.[1] A battery circuit was then completed with connecting wires, through the vibrating disc, iron filings, the copper wire let into the bottom of the cylinder, and through a pair of telephones in a distant room; after finding out by experiment the distance off the speaker ought to stand when speaking to this transmitter, and the proper degree of loudness he ought to give to his words, the voice came as clearly (and louder) as if a telephone had been used for a transmitter. If the speaker came too close or spoke too loudly the words were indistinct, and mixed up with a fizzing sound. In the experiment which was most successful the speaker was about 18 inches from the transmitter and spoke in an ordinary tone of voice. But this distance I found to vary with the thickness of the vibrating disc; a thin disc transmitted clearly only when the speaker was 3 feet off.

The ebonite cylinder was also filled with water (distilled) as an experiment, instead of iron filings. I thought that possibly the resistance of the circuit would be altered through the water, as the needle vibrated to and from the copper wire opposite to it; but no sounds were found to be transmitted. If the resistance of the circuit was altered when the disc vibrated in this experiment, it might tend to support the idea that alteration in the resistance of a circuit was not the only thing required to cause sound to be transmitted, but that "false contact" was necessary, such as would take place when the needle vibrated in the iron filings. G. R. R. SAVAGE

Roorkee, July 8

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[1] The disc well tapped with the hand so as to loosen the filings round the needle.

The Electro-Magnet a Receiving Telephone

THE result I have arrived at whilst experimenting in this direction seems so interesting, and at the same time, I believe, novel, viz., *that a good receiving telephone can be made from electro-magnets alone without any vibrating diaphragm*, that I hope by prior publication, to prevent the possibility of a string of those patents which nowadays so greatly hamper true scientific invention.

In my earlier experiments I made an electro-magnet out of a piece of ¾-inch iron gas pipe ¾ inch long, filed flat on one side, and split sufficiently only to allow the wire (No. 24) to be wound on, which was done till it was full inside. The poles were therefore together about ¾ inch square. This was fixed inside a small cigar box, under a ferrotype plate, covering a rectangular hole cut in the lid 2¼ inch by 1½ inch. With a Hughes' carbon-pencil-microphone tilted to an angle of 45° as a transmitter, a small musical box as a source of sound, in a distant part of the house, and one of Leclanché's cells in circuit, this box gave out tunes plainly heard by all sitting in the room.

Whilst experimenting with another similar magnet, I stood it loose, poles downwards, but still connected with the line wires on a flat tin gunpowder canister with the ends cut off, but still retaining the paper label on which the magnet lay; the tune of the musical box was given out loudly and resonant, but buzzing and jangling; also words spoken to the transmitter were heard, but confused together.

Now this was a very interesting result, which led to the next discovery; for, having a small ordinary electro-magnet with its armature in front (as used in electric bells), fixed to a piece of board, I was about to unship it to try experiments in various tin cans, &c., when it occurred to me to connect it as it was, to the line wires, placing only a slip of paper between the poles and armature to prevent actual contact. To my astonishment, on putting the ear close to the board at any part, the music of the box was heard clearly, every note from highest to lowest being distinctly given. Now here seemed to be a telephone without a vibrating diaphragm; but, to make more sure, the armature was unscrewed from its support and attached to the magnet only by an india-rubber band, with the slip of paper between it and the poles, so that it touched no other part of the apparatus. On listening to the supporting board, the sounds were heard as distinctly as before.

But even here forensic ingenuity might claim and attempt to prove that this ordinary armature was a vibrating diaphragm; therefore, an armature being itself nothing but an induced magnet, it was replaced by another electro-magnet, thus:—

Two ordinary electro-magnets (unscrewed from a couple of large electric bells) were fastened, by means of two little wooden saddles and a screw each, to a small piece of deal board about 4½ inches square and ⅝ inch thick, in such a way that the poles were all but touching. Their wires were then joined so that poles of opposite denominations faced each other, *i.e.*, north opposite south and *vice versâ*. This placed on an empty cigar-box and four Leclanché cells in circuit, gave out the tune of the musical box clearly and loudly in the room. When both poles were made to touch, the sound ceased; but with a thin piece of paper or stout tin-foil between them, without any intervening air space, the sound was heard. On gradually separating the magnets, the sounds grew fainter and fainter, till they became inaudible.

By putting the base-board close to the ear, whistling and singing to the microphone were very clearly and loudly heard, also the voice of the person speaking could be recognised; but words were hardly sufficiently defined to distinguish all that was said, though now and then parts were intelligible.

One of the electro-magnets was afterwards replaced by a small permanent steel horse-shoe magnet fastened to the board in a similar manner, the result was the same, but, I imagined, slightly louder, probably from there being less resistance.

By varying the strength of battery, size, or mode of mounting magnets, or adjustment of the microphone, I have no doubt that perfect definition can be obtained. The loudness and volume of the sound are ample; but before making further experiments, for which I have at present little time, I hasten to communicate the *fact* that *the electro-magnet, without any diaphragm whatever*, can be made a reproducer of sounds transmitted by a Hughes' microphone, and thus *a complete and practical telephone system produced without the possibility of infringing anybody's patent.*

I must add that the same arrangement is also a feeble transmitter, using a good Bell's telephone as a receiver, which is a very strange fact. I abstain at present from all theory on the subject. F. G. LLOYD

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